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VOLUME
XVIII

SPECIAL FEATURES

NUMBER
19

THE NEW PACKARD ENGINES
INTERNATIONAL AIR TRANSPORTATION
STABILITY AND CONTROLLABILITY OF AIRPLANES

GARDNER PUBLISHING CO., Inc.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office at Highland, N. Y.
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AVIATION

VOL. XVIII. NO. 19

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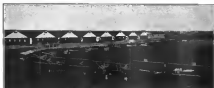
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VOL. XVIII

MAY 11, 1925

No. 19

Exploring Airplanes

THIS year 1925 bids fair to be the year in which airplanes become recognized as essential exploration aids. There is a prize in the Hawaiian jungle at the present time that has been won by a flycatcher. The McMillan expedition will take them sailing into the Arctic.

In both the Ross and McMillan expedition airplanes are used principally for aerial mapping. The explorer previously selects a territory to be eventually mapped by explorers, the first one it is covered. This is in great contrast to the previous method of exploration. Everyman traverses the unknown land by a slight error on a sketch made during one of the Ross's expeditions, a river apparently running uphill. In the Arctic, Crocker Land has been a subject of study for several decades because all sketch maps failed as to its location and no one has been able to reach the place where it is supposed to be.

A spotting element as well as exploration will enter the Arctic aerial plane this year. A flag and two flycatchers are in the race to be the first to fly to the pole. This cannot be done in pure exploration, although the collection of data seems to be a secondary consideration with both parties.

It is to be hoped that the McMillan-Navy expedition will not be drawn into this contest, as this would undoubtedly seriously detract from their value in exploring Axel Heiberg and Crocker Land. John L. Rose, the radio operator, will probably maintain constant contact with civilization, away ship, via short wave lengths. This will keep the expedition before the world without the aid of spectacular stunts. The spirit of the McMillan-Navy expedition is a scientific expedition and not a task of aeriality.

Airship Moorings

IT is only a little over a year since the U. S. Navy airship Shenandoah broke away from its mooring mast. We now have the similar case of the British R-33. Although the details of the case of the last airship are still lacking, it is perhaps worth while trying to find some features of the present spirit of mooring to a mast, which might be fundamentally responsible for such a strange appearance of the same accident. The impression received by the public has apparently been colored largely by the dramatic nature of these two episodes. In both cases the airship broke away in a terrific storm which did great damage to shipping and other property. In each case although badly damaged, the commander and crew at the airship made a gallant fight against great odds and brought the airship safely home again under its own power. This has naturally resulted a feeling of general respect for the nervelessness of the airships themselves, with a corresponding tendency to consider the mooring mast as just an old fashioned.

From a technical standpoint however, the conclusion should seem to be exactly the opposite. In each case the breakaway occurred at a wind of very high velocity. It must also be admitted that the ship was designed to be able to stand considerably more stress, providing it was loaded suitably. Unfortunately this is not the criterion for rigidity or stability in choosing a mooring. The fundamental trouble is that the center of pressure for small angles of yaw on an airship of this type is considerably in advance of the mast. In other words, paradoxical as it may seem, when the wind strikes the side at a small angle, the point of application of the resultant force is not on the ship at all, but a certain distance ahead of it. The result is, that even when moored to the top of the mast, the ship will still not lie back, but keeps trying to yaw to one side or the other.

The difficulty is much increased by high winds which bring greater gustiness, thus adding the effect of inertia to the already inherent instability of the airship itself. Add to this the fact that these side forces in yaw are far greater in magnitude than the tension resistance and the fundamental cause of these breakaways is at once apparent, no matter what the direct detached cause may have been. Recent aerodynamic developments show that it is possible, by proper attention to the details of airship design, to move the center of pressure not only well behind the axis of the airship, but almost back to its own center of gravity. This should be of very great help in mooring such craft safely in the open in all kinds of weather.

"Beware—Government Flying Field"

SIGNS with the above warning will probably be the next step in the government's cooperation with commercial aviation. The new rules for War Department flying fields, printed elsewhere in this issue, will clarify the extent of private aircraft. They say plainly: If you operate an airplane for profit, you must not, under any circumstances, approach a government field. If you are a private owner and want to visit an Air Service Field occasionally, you must secure the permission of the commanding officer, secure identification your plane is licensed in a properly coded manner and that an assistant will be on duty at your air to maintenance, repair or operation—and then furnish a bond for \$5,000 to protect the government against damage to property.

Such regulations are not only sound but are almost iron-clad in their severity. They can only be the result of more "arm your direction." Pretexts against barring them from the flying fields of the Government that are paid for and supported by public money should be addressed to the Secretary of War. If you feel that these rules are improper and will tend to retard flying, write and say so.

International Air Transportation

By LADISLAS DORCY

Among the companies air lines which control the principal routes of Europe with one another there is one which stands out from the rest, not only by reason of its far-flung services, but also because it represents an interesting solution of international air navigation. This company, the International Airways (Compagnie Internationale de Navigation Aérienne) or "C.I.N.A." was formed in April, 1930, under the name of Franco-British Airways, for the purpose of establishing regular postal connections between France and the countries of the Baltic, Eastern (Czechoslovakia, Poland, and Rumania). Its sponsor was M. Alexandre Blum, a Rumanian banker, who furnished almost the entire initial capital of the company, which was later put into the hands of the French civil aviation, which had been chief of air service at French General Headquarters during the latter part of the War of 1914-18, was elected president of the company in view of his wide and varied experience in aviation.

Political Negotiations

Even before the company had been formed, negotiations were started with the countries through which it wished to obtain for their permanent assistance in the form of subsidies and exclusive postal contracts for the services proposed. This was successfully accomplished largely in the strong political support the company received in these negotiations from the French government. The latter also granted the C.I.N.A. a large subsidy and by the end of 1931 the first four services had been put into operation. Warsaw, the capital of Czechoslovakia, a distance of 300 miles. The following year this line was extended to Warsaw (Poland), which increased its length to 650 miles, and small service stations were opened at the two airports of Lillo.

In consideration of the political difficulties the C.I.N.A. later experienced in operating this service, it is well to state at the outset that the last two of the four air routes from Paris to Warsaw laid over German territory. 250 air miles between Strasbourg and Prague, and 120 air miles between Prague and Warsaw. No regular part of mail in German territory was scheduled for the C.I.N.A.'s service, but it was often loaded for fuel at Nuremberg and at Breslau. Under the terms of the Treaty of Versailles Allied civil aircraft had the right to land in Germany, but not to land without the permission of that country and without reciprocal treatment in the part of the Allied state. Jan. 1, 1922, at which date Germany ratified the sovereignty over her air space. It seemed almost certain that from that time when the Paris-Warsaw service was started nothing should have stopped to think that Germany would use this clause as a powerful lever for obtaining concessions in other spheres of international relations, whereby German civil aircraft are privileged to land in Germany, but such was the case. Without having any agreement with the German government for securing the future of the Paris-Warsaw line, the C.I.N.A. was obliged to leave Germany and waited the calendar for the date when it could with impunity throw the matter overboard into the machinery of international air transport from which it was excluded.

Airway Doubled

In 1922 the C.I.N.A. more than doubled the length of its air services by establishing a break line from Prague via Vienna, Budapest and Bucharest, to Constantinople. The total personnel of pilots, mechanics, engineers, cabin attendants, etc., were numbered 250 and the fleet of the company comprised 84 airplanes at present 63 for the previous year. The flying equipment was considerably improved by the purchase of light powered ships, such as the Albatross, Spitz type 66, with 400 hp. Lorraine engines, while the heavy powered machines and Potez IX ships, with which the service started and which were converted war machines, were gradually put in reserves. Large repair depots were organized at

Le Havre (Paris), Prague and Bucharest, the last being located particularly well equipped for assembling machines from the ground up.

Germany

The year 1933 started with a warning from a German government that Allied civil aircraft would have to obtain from it special permission to fly over German territory and that these not observing this ruling would be considered. The C.I.N.A. decided by disregarding this warning and to continue its services, acting therein as directed by the French government, which considered that Germany would not order the arrest of the planes, but only to detain them and to take other foreign civil aircraft. (By that time Warsaw, Prague, Bucharest and Vienna air lines were running a route into Germany, and before the end of the year a British company, the Imperial Airways, joined the job.) However, Germany stood up supported on the Council of Ambassadors by Great Britain which naturally was not at all anxious to help a commercial civil which through a series of agreements had previously obtained permission to fly over German territory to the Near East. And so Germany stood pat and continued, one after the other, fourteen ships of the C.I.N.A. which were forced landings in German territory during 1934. To make matters still more unpleasant for the company, the German civil air authorities discontinued landing further permits for this route, which made the operation of airmail lines very hazardous.

Turkey

At the other end of the line, at Constantinople, the police sky was pretty dark too. Having, after the Treaty of Locarno, been put in possession of the airport of this station, which the Allies had built up near the Turkish capital, the Turkish government had decided to limit the number of companies that land there only Turkish airmail companies were permitted to operate in Turkey.

It is greatly to the credit of the C.I.N.A. that in its endeavor to keep its line open, it did not allow itself to be occupied but methodically continued to carry on its line. During 1933, Heligoland, the capital of Transylvania, was a station on a stopping point in the Paris-Bucharest line to the Balkans-Southern section was completely stopped by night flying. The better service, which was officially suspended in September of that year, was the first of its kind to function anywhere in the world as a regular schedule.

Night Flying

On its 370 mi. long night route, three-engined Gladiators are used. The last type C-2, is equipped with a motor 400 hp. Lorraine engine and two 260 hp. Hispano engines in the wings. Eight passengers can be accommodated in a spacious cabin lighted by electricity and supplied with water, food and other necessities. The operation of these ships has proved entirely successful, and the need of safety they are building up is gradually reducing the reluctance of the public to fly at night.

When the C.I.N.A. resumed its service in 1934 the company does not operate between Nov. 15 and March 15. The German has against French civil aircraft only on the ground that it is in force but it was even extended to other British aircraft, which, during the previous year had been given preferential treatment for political reasons. As a result the Imperial Airways decided to suspend its London-Berlin service, but the C.I.N.A., with the approval of its French government, continued to fly over Germany.

This action incidentally furnished the company with an excellent publicity, for at the time the flying season of one ship had a forced landing out of 370 ships on the open forbidden territory. The confidence of the segment and of the maintenance service was also strongly demonstrated.

Under other particularly trying circumstances which Germany would have put before the company's commercial reputation. The service shown on the plane changed with the possibility of sailing through the air in a friendly spirit, however, better be imagined than described.

Traffic

The last two years were excellent from the viewpoint of growth which progressed with leaps and bounds, particularly between Paris, Prague and Vienna. Whereas in 1932 the company's planes were rarely more than half loaded, in 1933 and 1934 they were nearly always full of passengers. The company had to refuse for lack of cargo space as much as three-fifths the freight it was offered at the various airports.

The following table shows the development of the company's business in three years:

1932	1933	1934
Passengers carried (thou.)	125,000	150,000
Freight carried (thou. lbs.)	1,000	1,500
Letters carried (thou.)	1,000	1,500
Parcelled goods carried (thou. lbs.)	1,000	1,500
Mail carried (thou. lbs.)	1,000	1,500
1932-1933	1933-1934	1934-1935
Passengers carried (thou.)	125,000	150,000
Freight carried (thou. lbs.)	1,000	1,500
Letters carried (thou.)	1,000	1,500
Parcelled goods carried (thou. lbs.)	1,000	1,500
Mail carried (thou. lbs.)	1,000	1,500

During 1934 the difficulties with Turkey were straightened out, the service to Constantinople was resumed, and a detourment service from there to Moscow was put into operation. This was undertaken by the C.I.N.A. for three months. Meanwhile a German concern, the Junkers Airways, had also been established, and now a new line from Berlin to Moscow is being constructed. It appears that the French and the German company each worked definite "leads" in the Turkish government and that each secured definite promises that it would get the right to fly over the country and to land and freight. When the rival firms finally discovered the situation, the Turkish government obviously estimated that from any extension by letting the two leaders to go ahead and run a competitive enterprise, a serious rift between Constantinople and Ankara for three months, after which an accord would be made on some work. The Junkers Airways did not seem to see this addition, for they withdrew from the C.I.N.A. and did so without any serious protest. For three months the ships flew regularly between the old and the new capitals of Turkey, though the company's service was not continuous. But when the trial period had elapsed, the C.I.N.A. had to get the recognition, for now the Turkish government made the usual amendment upon the contractor's offering as air-planes, and the Turkish government requested for producing airplanes of original design.

New Organization

However, suspended this stipulation, which obviously favored the Junkers Airways because of their close connection with the Junkers airplane manufacturing company, the new lack at the C.I.N.A.—members, membership men and her tenders—refused to be lulled. Instead they continued within a very short time a general aircraft agency to act as an intermediary between the French aircraft industry and the company's operations. This agency will handle all questions pertaining to the construction of aircraft, the supply of aircraft materials, operation of aircraft factories, supply of raw materials, etc. As the C.I.N.A. has agents in all the ports with one exception, Khabarovsk, and in all the most important cities, it will be seen that this scheme starts out extremely favorable auspices.

The reason why the terms of the Turkish government are so important to the C.I.N.A. and its partners is that the only commercially feasible air route from Europe to India, China and Japan, leads through Constantinople, across Turkey and Mesopotamia. During the various agreements with the Turkish government, the C.I.N.A. has been with Austria, Hungary and Bulgaria, the C.I.N.A. is very strongly interested, politically and economically, in the route from Paris to Constantinople. For a long time the British government has been endeavoring to shake the hold by attempting to establish an alternative route to the East, but without any success of these schemes and are it is suggested

that the C.I.N.A. and the Imperial Airways have come to a tentative agreement as to the future operation of the great Europe to Asia airway. Under this plan the C.I.N.A. will run the service from Paris as far as England, while the Imperial Airways will operate from there on to India and Burma.



The C.I.N.A. Airways. The dark dot routes over Germany and Turkey have been abandoned. The dotted routes are for the future.

The German air interests, which have been left out of this scheme, naturally try to win all their old to cut into the great Franco-British airway and get a share of the coming air service before the best opportunities are gone. Turkey and Persia are the countries in which they concentrate all their effort at the present time. The Junkers Airways, however, will be used to extend over the entire "Mediterranean" world—also reported as organizing an airway through their Russian branch which will lead right across Persia, from the Caspian Sea to the Indian frontier.

K.L.M.

Last, but not least, the "K.L.M." or Royal Dutch Air Line, which is headed by important Dutch banking and exporting interests, is said to be negotiating with the French government to establish a new service from Amsterdam to the Dutch East Indies, a route of which was brilliantly demonstrated by Van de Hooft's flight from Amsterdam to Batavia.

It will be seen from the above that a continuous air service from Europe to the Far East is now being realized, even though present aviation often seems to work at cross-purposes. That such a service will have to be essentially international is a factor to be considered by all concerned, for it is not to be accepted by an ever growing number of states of the problem. How such a service can be made international and yet remain under the financial and technical control of the country which is primarily responsible for its organization is, on the other hand, a problem which baffles many a good mind. The Germans are fostering operating confusion or access of small additional companies which are partly financed by Germany, and are not entirely equipped with German material, but which operate under their own national colors though in cooperation with the parent organization.

On the other hand, the British system is controlled by the C.I.N.A., which toward the creation of a strong national company in which the majority of the capital stock is held by nationals of the countries into which the company operates. From the viewpoint of the operating company this system has the great advantage of order. It not only excludes control but unity of control as well—while the German operating companies lack, but from the standpoint of the foreign economy it has the disadvantage of preventing the development of a great network of national air transport companies in the world, "self-sufficient" countries. The latter conclusion is not merely one of nationalistic pride, for with the development of non-commercial aviation for war purposes and for war purposes cannot help but grow.

In this connection it is of interest to note that when the

CIDENA recently received an assurance of Czechoslovakian support—which determined the shape of the company's name—the company had to guarantee employment to a given number of Czechoslovak pilots and mechanics. To make this more operative, the French Parliament had to amend the air navigation law under which the entire flying personnel of French army companies must be of French nationality. The amended text provides that a company drawing subsidies from a foreign country may employ nationals of the latter among its flying personnel. Whether this means that a Czechoslovak pilot may command a French aircraft remains to be seen. If so, it would indicate a departure from the routine practice incorporated in the International Air Convention under which the pilot in charge of an aircraft must be of the same nationality as the aircraft. It is possible, however, that the CIDENA will encounter the difficulty by employing foreign pilots for test work only.

In the case of Czechoslovakia or Poland this question is really of secondary importance, for these countries are allies of France. With Russia, which is now negotiating with the CIDENA for an extension of the Paris-Prague-Warsaw service to Moscow, the proposition would be more delicate, as may well be imagined.

This year, for the first time, the CIDENA will not fly over Germany, as under the peace treaty France can no longer claim the most favored nation treatment which was the basis of her claim to fly up to the first of the year. Instead the services to Warsaw and Constantinople will be run via Bile, Zurich and Frankfurt, as shown in the accompanying map, under the terms of Franco-German air relations in straightened out.

French Cross-Country Meet

The Aero Club of Amberg, France, is holding a national air meet on May 31 and has organized a rather novel form

of it, to be held during the day but most active of the afternoon, if they arrive earlier they will not be able to cover so much distance and if they arrive later they are penalized, or completely eliminated if they are more than 2 hr. 15 min. late. This will tend to bring all the contestants to the stadium at about the same time which will make it much more interesting for the spectators. During the six hours allowed for flying, the contestants try to cover as much distance as possible. Those controlling official must witness the start and as many stops as desired can be made along the route. However if the pilot wishes to complete the distance which is fixed by going on a straight course, instead of the ground distance in a straight line, in most steps of designated control points, so that the distance can be checked. The efficiency is measured in the square of the distance covered during the six hours divided by the horsepower per passenger carried. This simple formula is supposed to make it possible for him and small planes to enter into the competition with their own depending on their efficiency. Flying the greatest distance during the six hours showed pilot a precision on the speed of the plane and bring up to a schedule besides the rules of greatest speed. There is a certain amount of luck in choosing a point which will be favored by the wind as well as in having not a course which can be covered in the suggested time and as avoiding a penalty.

National Balloon Race

As we go to press, it is reported that the Goodyear 128 piloted by W. T. Van Orman landed at Berlin, Md., approximately 600 mi. from St. Joseph, Mo., the starting point. All the other contestants have landed at shorter distances from the start.



International Air Meet Photo.

Some during a recent aerial pageant at the Yagor's Paraly Ground, Tribes under the masters of the Kojima Shogun, a biplane. The two airplanes in the upper right hand picture are a Supermarine and a P-40.

The New Packard Aircraft Engines

Detailed Description of the Latest Aircraft Engines Produced by the Packard Motor Car Co.

The new Packard aircraft engines are built in two sizes, the model 1580 rated at 500 h.p. and the model 2560 rated at 800 h.p. The engines are of almost identical design except in size and were developed concurrently to fill the demand for the same range of water-cooled engines as is already being produced. The smaller power output of the model 1580 is due to a 5 h.p. to well over 100 h.p., giving long forward thrust and in being the propeller speed down to the point of maximum efficiency.

Naturally the engines present an exceptionally clean appearance and are remarkably compact for their power output as shown by the superimposed views of the model 1580 and model 2560 in Fig. 1. The relative power outputs of the two engines are shown in Fig. 2 and a propeller speed comparison is shown alongside. From these diagrams it will be noted that the new small Packard engine is considerably lighter and more compact than the Liberty but delivers the more power. The larger model 2560 engine is equal in Fig. 3 in respect to power output and weight with the Liberty and the model 2560 engine, which is the Vercelle Packard plane, winner of the first Pulitzer prize.

The compact construction, light weight and high power output of these new engines have been brought about by some rather advanced in aircraft design. The new engines are the last expression of the Packard Motor Car Co. in designing and building airplane engines in quantities. In laying down the design the following fundamental principles were followed:

- (1) A very high degree of reliability must be attained.
- (2) Greatly reduced weight and compact dimensions as compared with previous designs are highly desirable.
- (3) The design must be simple, capable of production in large quantities and amenable for maintenance in the field.

Bearing Research

A comprehensive survey was first made of the fundamental factors in the design which would be most affected in carrying out these principles. It was found that the design of the shaft-hub bearings would have the greatest effect on the weight work as the length of the bearings would determine the length of the engine in a large extent. Accordingly, a series of bearing tests were run in a special test room for six months in order to ascertain the ideal combination of material, loads and stress. As a result of this work it was found that if the bearings were made sufficiently rigid and a rapid rotation of all was maintained throughout the bearings, in order to provide lubrication and carry away the heat generated, it would be possible to obtain satisfactory results with much less narrower than had hitherto been thought advisable.

For example, it was found that in endurance tests of these engines that a bearing load factor as high as 16,000 lb. per sq. in. per sq. in. could be maintained over the entire life of bearing life than previous aircraft engine bearings had only half as much but which were not as rigidly supported or as well lubricated.

While the compact construction of the new engines are largely determined by the new developments in bearing design, a contributory factor is the cylinder construction of these engines. The cylinders are individual and are of all sizes and shapes. The six cylinders in a bank being formed into a block by means of an aluminum casting around the valve housing to which the cylinders are bolted. The cylinder is composed of a drive end sleeve which is forged in place and a head which is milled and all over and fitted with a lead plate and sheet metal water jacket welded in place. Each cylinder is provided with four valves and four valve ports are formed milled into the cylinder head. The ports are accurately milled and milled on both outer surfaces and the head plate is bound so as to form a perfect fit over

the valve ports, the plate seating on shoulders so as to give about 3/16 in. water space over the top of the combustion chamber.

The cylinder head is provided with five bosses into which long studs are inserted, thus supporting the valve housing. The upper plug bosses are drilled aligned with the combustion chamber. The weight of the complete model 1580 cylinder is 9.5 lb. and this cylinder develops nearly 50 h.p. The weight of the complete model 2560 cylinder is 15.5 lb. and this cylinder develops nearly 70 h.p. It will be noted that the cylinder head-boss design is located some distance from the side of the cylinder head which permits of a very compact construction as the ends of the bearing of the two banks are perfectly aligned to touch inside the crankcase, the additional height of the crankcase due to that construction.

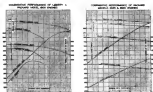


Fig. 2

Fig. 3

materially improving its reliability. Incidentally, it is the fact that the cylinder barrels project inside the crankcase which permits of these engines being run successfully in an inverted position, an arrangement now favored by many airplane designers.

Water is fed into the individual cylinders from a manifold connected to short pipes welded to the jacket at the lower end and the water delivery from the cylinder is through a series of holes drilled in the top plate and arranged radially around the exhaust ports so as to cause upward and strain motion over the exhaust valve seats. A single superheated piston pin is used between the individual cylinders and the valve housing, this pin is, of course, not subjected to pressures as with the conventional automobile detachable head gasket but merely serves as a water seal and to prevent leaks between the inlet and exhaust passages.

The valve housing is an aluminum casting machined on all surfaces and used interchangeably on the right and left hand banks. The housing performs the following functions:

- (1) Distributes the mixture to the six cylinders from the two carburetor cross header manifold connections.
- (2) Forces the exhaust passages, each two adjacent cylinders having these two pairs of exhaust ports milled into a single exhaust outlet.
- (3) Guides the water circulated through each cylinder jacket and delivers same through a single outlet at the front of the engine.
- (4) Supports the crankshaft bearing pedestals and valve guide bushings.

Fig. 4 shows dimensionally the layout of the intake, exhaust and water passages in the valve housing and the weights

arrangement of four valves feeding from a common port will be noted. The advantages of this arrangement are that large and close passages are provided and the seating is simplified due to the absence of intermediate walls.

A single camshaft is supported in seven cast aluminum bearings bolted to the top of the valve housing and this cam shaft is provided with twelve cams, each one operating a pair of valves through the medium of a cam follower working in a vertical guide flared integral with the camshaft bearings. These cam followers are prevented from turning by means of a flat milled surface on the side of the camshaft bearing. The cam followers are positively lubricated from the adjacent camshaft bearing and the exhaust cam followers are also actuated as pumps to force oil through the exhaust valves for cooling purposes. This feature of the design is shown diagrammatically in fig. 5 and the method of erecting the oil through the valves is described as follows.

Valve Cooling

The camshaft is before and supplied with oil under pressure through a main passage entering from the rear main tank. In the camshaft journal next to each exhaust cam a hole is drilled opposite to its axis



Fig. 5

and this hole receives with a vertical passage in the camshaft bearing port when the cam is at its highest point and the exhaust valves automatically closed. The oil flows through this passage to the bottom of the cam follower guide which forms a closed end cylinder and the space underneath the cam follower is then filled with oil. The camshaft on revolving cuts off communication with this passage and when the cam follows in the rear the oil can only escape by being forced through the hollow cam follower stem and the horizontal drilled passage leading out through the drilled tappets into the exhaust valve stems. The latter are drilled over their entire length, the lower end of this hole in the valve head being closed by a screw-down plug. A small steel tube is welded to this plug and is centered in a counter-bore at the upper end of the valve stem. The oil is forced down through the hole cut at the bottom through horizontal holes and then into the head of the valve. The oil is then discharged through the annular space between the tube and inner wall of the valve stem and out into the valve housing through horizontal holes drilled through the upper end of the valve stem just below the counter-bore. With this system a fixed quantity of oil is passed through each exhaust valve each time it is opened and thus a very positive method of cooling is provided. As a result the exhaust valves operate at a very low temperature and the valve work is prevented in efficient operating conditions over extensive periods.

Valve Springs

Another feature worth mentioning in the valve gear is the valve spring construction. Instead of the conventional aircraft arrangement of double coiled valve springs a series of small diameter piano wire springs is arranged in planetary fashion around the valve stem guide. In the model 1500 engine there are seven of these springs to each valve and in the model 2500 engine there are six springs to each valve. The individual valve springs are located over tubular guides welded to a lower fixed member and the upper ends of the springs engage in a similar groove formed in the sleeve spring holder.

This valve spring construction has been used for several years with perfect results on Packard marine racing engines which had increased their considerable trouble with valve spring leverage at extremely high speeds. The reason for this perfect construction is not due, as might be thought, to the valve follower or safety. It is due to the fact that the small diameter springs the natural period of vibration is very much higher than in the conventional type of valve spring so that

the destructive "blowing" of the valve springs is avoided with the small diameter springs.

A very light steel aluminum cover is fastened to the valve housing and prevents external leakage of oil, the cover making a taper fit over the spring distributor drive housing located at the center of the cover and described later. Oil from the valve housing is returned to the crankcase through



Fig. 6

internal drains placed in both ends of the engine and provided with oil traps to prevent crankcase vapors accumulating in the valve gear compartment.

The crankshaft in both engines are of the conventional but section type, the main bearings being supported on the transverse webs of the crankcase upper half. The crankcase flange surface, to which the oil pan is bolted, is beveled down 5/16 in. and 5/16 in. on the models 1500 and 2500 engines respectively below the centerline of the crankshaft. It is kept being flared, to add rigidity to the crankcase structure, as well, to provide "wavy" ribs which the main bearing caps are fitted and thereby to render the oil pan attaching more and more accessible.

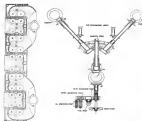


Fig. 7

The bearing caps are dovetailed forgings except in the case of the front and rear caps which are cast of a special heat treated aluminum alloy. The main bearings are of ball-bearing construction and are secured to both the bearing caps and the crankcase upper half. The main bearings are provided with three feed lubrication, of ball-bearing construction, with valves in the outer case upper half and distributing through vertical holes leading to each bearing pressed in the crankcase transverse ribs. The oil pan or crankcase lower half serves as a sump for the combined water and oil pump unit and is provided with the scavenging oil line leading to the first end oil serving to keep the crankcase scavenged on a glide. The oil

pan can be removed from the engine at any time without disturbing the engine bearings.

The crankshaft in both engines follow customary aircraft engine practice and are entirely free from flywheels, the main journals of the two engines measuring 3 in. and 3 1/2 in. in diameter respectively, and the crankpins are 2 1/2 in. and 3 1/2 in. in diameter respectively.

Both main journals and crankpins are bored out with large holes and the crankpins are plugged to provide an oil reservoir for lubrication to the crankpin journals. These reservoirs receive oil from the adjacent main bearings by means of steel tubes pressed into the crankshaft at an angle and leading up with the main bearing scattering grooves at one end and the oil caught here in the other. The main bearing scattering grooves are located entirely in the upper half of the main bearings and extending the whole 300 deg. around their circumference.

The oil scumming rails of the model 1500 engine are of the forced oil pump type fitted with float valves bearings, and the main scum rails of the model 2500 engine are of the unforced type fitted with ballcheck bearings applied directly to the big end of the rod. The piston pin bearings in the connecting rods of both engines are of phosphor bronze and the main crank pin is used in the back pin bearings of the larger engine. The link pins of the model 2500 engine are obtained in place by a tapered drive bolt passing through a hole in the main rod.

The pistons of both engines are aluminum castings of the general mild type and are of the slipper type. Their are

2500 pistons is 0.9% in. in diameter, 3 15/16 in. long and weighs 4.47 lb. for the bare piston. The lengths of these two pistons were established after a series of tests were made in which the length of the skirt was gradually diminished.

The timing gear and accessory drive byproduct is shown in fig. 8 and is worthy of some study, for the simplicity, there being the maximum number of gears employed, smoothly, for the intended constructive of shaft and gear alignment, while preserving dependability to the utmost extent.

The simplicity of drives was accomplished by grouping the accessories in a manner which effected important additional weight savings. All fuel, oil and water pumps were mounted into a single unit which is used interchangeably on both the model 1500 and 2500 engines. This unit is driven through an Olden coupling from a short shaft journaled in the rear bearing cap. This shaft carries an integral gear gear as its upper and which meshes with a bevel gear mounted on an extension of the crankshaft.

The rear end view of the model 2500 engine shown in fig. 7 brings out the simplicity of the accessory drive layout as compared with previous types of aircraft engines, and the absence of engine accessories projecting to the rear of the engine will be appreciated by those having had maintenance experience with aircraft engines which have been installed in a crowded position against the firewall or front bulkhead of a plane.

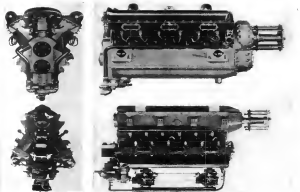


Fig. 8 Above the 800 hp geared model. Below the 500 hp geared model.

scavenging for being extremely short and compactly fitted. The model 1500 piston is 2 1/2 in. in diameter, 3 15/16 in. long and weighs 2.54 lb. for the bare piston. The model

The pump unit contains three spur gears which are housed in to form the two oil scavenging pumps and these gears in turn gear three another set, the first driving the water pump,

cent. If on the other hand the airplane is flying at 50 ft./sec., the yaw in roll will be $(50/50)^2$ or about 8 per cent. When the speed increases, the yaw in roll will be affected, but the value of the rubber for maintaining lateral stability at very low air speeds can be readily appreciated.

Consequently, we will now return to the effect described above, the effect of angular velocity of yaw on the roll, as the "first effect" of yaw, as distinguished from "yaw effect," resulting from the fact that the airplane is yawed. There are by no means exceptional cases, and are used here only for brevity in the following discussion of airplane behavior.

The second effect comes from the fact that when the airplane is yawed, its stability in yaw tends to adapt itself to the yaw, as we showed it while discussing the elements of stability in roll. The airplane stable in roll will tend to raise the wing on the side of the relative wind, and consequently the opposite side of the yaw rate, as the yaw rate is in the same direction. In this case both effects of the yaw act in the same direction and naturally make the airplane become bank and eliminate the yaw. Such an airplane will be steered correctly by the rudder alone without the use of the ailerons.

The airplane normal with respect to stability in roll will not respond to yaw, and may still be stable indefinitely. In that case there will be no cross effect of the yaw, and the rudder effect on the roll as may be found will be derived entirely from the first effect, that of angular velocity of yaw. To obtain the benefit of the first effect in position, yaw and roll, the rudder, of course, must be equipped with a yaw and therefore large difference in velocity of two wing tips.

An airplane unstable in roll will bank in the opposite direction, i. e., will turn away from the side of the yaw, and the side slip resulting from such a bank will be added to the relative wind due to yaw, and will cause the airplane to roll still more, and so on until it will yaw. It is evident that in this case the rudder cannot be used for control of the roll in any event.

Model Demonstration

The idea of combined action of the stability in yaw and roll can be obtained best by studying the behavior of the elementary models shown in Fig. 15. Such models were constructed by Barinova, and were used by him for popular demonstration and explanation of lateral stability of airplanes as derived from his mathematical reasoning. Sketch A shows a model consisting of one flat sheet of wax loaded at the leading edge, without any dihedral, stabilizer or rudder. For this model, the stability in roll is required by stability in either roll or yaw, only a very slight degree of stability is derived from the movement of the center of gravity. If loaded with a few pennies, it will yaw, but will acquire a fair glide, but if disturbed it will yaw or lean, and some angle of bank it will slide into the ground without showing any tendency to right itself.

Sketch B shows the model taken from A by the addition of an empennage, particularly a large vertical fin. The model is very stable in yaw and is almost neutral in roll. This model starts a few glides, but has a pronounced tendency to start the turn and to turn into a steep spiral. Any disturbance in roll, however slight, causes only slip, and the stability in yaw makes the model head in the direction of the relative wind. The negative yawing of this turn makes the outer wing move faster than the inner one and thus increases its lift and consequently adds to the roll. In this case initial roll causes yaw, and the yaw aggravates roll. This type of instability in rolled airplanes is known as spiral instability. We call particular attention of the reader to the fact that it is the predominance of stability in yaw over stability in roll that causes the instability, and the increase of stability in yaw by increasing the size of the fin will aggravate the spiral instability. The only remedy is to increase the stability in roll, by the addition of dihedral or a vertical fin, and over the opposite side of the fin, a vertical fin, when the stability in roll produces a restoring rolling moment, quicker than the yaw (first effect) generates an opposing rolling moment in response to the side slip.

Sketch C shows the model made stable in yaw by the addition of a large fin surface forward of the center of grav-

ity and by reducing the size of the empennage. When launched this model flies straight for a few feet and then starts a quick yawing motion, which immediately causes it to bank on the direction of the turn, as well as to turn forward slowly, with the result that a typical roll motion develops. This case is known as *spin* (laterally). The intermediate case between B and C is exhibited by dipping the nose fore and aft, so as to obtain fair stability in roll and moderate instability in yaw. If such a model is placed by some accidental disturbance, say by the left, its stability in roll will make it roll to the left, while instability in yaw will increase the yaw in the same direction. This results in a rather sharp turn, the model overcomes the tendency to slide to the left, which increases the direction of movement, starts yaw and roll to the right. In a short time the model regains its position on an even level again, but is still yawing to the right, which results in a repetition of the cycle in the opposite direction. The model displays in flight an oscillating and yawing motion, usually increasing in amplitude.

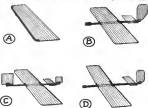


Fig. 15

Sketch D shows the model made stable in roll by dihedral of the wings and in yaw by the addition of vertical empennage. The stability in roll predominates over the stability in yaw. This model rights itself and acquires a glide on a straight line, no matter in what attitude it is thrown into the air. If launched from some height with wings in vertical position and fuselage horizontal, it immediately begins to roll to gain horizontal position of the wings, yawing at the same time head in the direction of motion. A glide in a straight line is invariably reached, but the direction of original motion is not preserved.

The stable model, or airplane for that matter, has a tendency to move in a straight line, but has no preference as to the point of the compass, and probably will change its direction of motion after each notable disturbance. The disturbance in the direction of travel results naturally in the stability in yaw, and will be least when the airplane is neutral in this respect, i. e., when any disturbance in roll is corrected by the stability in roll alone, without affecting the yaw.

In closing this chapter we will emphasize that sufficient vertical empennage results in spin instability in the case of airplanes normal in roll, and in unstable motion in the case of airplanes stable in roll. A moderate size of the vertical empennage will produce a stable model or airplane, while a further increase of the empennage now results in *spin* or instability. If the stability in roll is low, the adverse value of the empennage now is extremely small, and slight change of its position in spin or spiral instability. As the stability in roll is increased, the airplane becomes more and more unstable in yaw, and the empennage must be made without danger of producing lateral instability.

(To be continued)

How the War Department Retards Flying

The War Department is asking further appropriations for aviation claims that it is interfering commercial aviation. Recently, drastic orders have been issued regarding the use of government flying field facilities by private aircraft. It should be remembered that private have recently been made equal to the competition of the government with private aircraft systems and it is possible that these regulations are not in the interests of those objectives. The War Department claims:

"It is the policy of the War Department that owners of private aircraft should not be permitted to use any active government flying field facilities as a base. The use of such facilities by owners of private aircraft may, however, be permitted, at the discretion of the commanding officer of the station, upon condition that the aircraft is not operated for profit, and is located at a privately owned hangar and loaded or unloaded at properly, and such aircraft will not be required from it a payment of the station as to maintenance, repair or operation."

"In the case of Government-owned airplanes, maintenance facilities are being on a strict basis, operations of private and commercial aircraft may be permitted, upon condition that the aircraft is not operated for profit, and is located at a privately owned hangar and loaded or unloaded at properly, and such aircraft will not be required from it a payment of the station as to maintenance, repair or operation."

"With regard to airplanes owned by the Government, owners of private and commercial aircraft may obtain permits from the owner to use the facilities at such airfields under the rules and regulations that apply to the use of the airplanes in Army organizations. In all cases, however, this permit must have the approval of the War Department."

Bond Required

"All persons before obtaining permission to use airplane facilities as contemplated in paragraph 1, 2 and 3 above, must furnish a bond for \$10,000 to protect the Government against damage to property."

"Nothing herein contained shall be construed so as to deny private owners the privilege of landing on Government landing fields in emergency emergency life or death."

"Owners and operators of aircraft making use of facilities at Government stations for the purpose of landing, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 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800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000."



From Field and Station

Uploading the wings of the DeHavilland Moth (DMM) and ready for flight

Photo P. P. A.

The DeHavilland Moth

The latest production of the DeHavilland Aircraft Co. of England is the Moth (DH80), private plane. This machine is a single-engine biplane, closely resembling in general outline, the DH8 of the same designer. It is intended to be used for training and private use and is powered with the 60 hp. Gipsy engine described on page 203 of the March 20 issue. Pilot and one passenger are accommodated in two seats, both of which are fitted with controls. The joystick to the front cockpit can be removed and an alternative one is provided in the rear cockpit in the floor.

This machine is set a light plane in the true sense of the term but it is designed to be used as the advocate of the light plane position; that is, for training, for flying club equipment and for private use. While the same performance will come out of it, it is a true light plane machine. The place is available today and should find ready welcome.

The outline is a single bay biplane with an opencockpit and a three and a half degree dihedral angle on both upper and lower wings. The wings fold back making the covered span when folded that of the tailplane. A fuselage strut is provided to support the upper leading edge. It is claimed that the wings can be folded back or raised for flight by one man in three minutes. The empennage is quite conventional. Ailerons are fitted to the lower wing only.

The engine is mounted directly on the top longitudinal which are strengthened at this point for that purpose. The carburetor projects outside the nacelle giving security against fire. A metal shield prevents undue cooling of the carburetor. The fuel tank is in the form of a thickened wing section and forms a center section. It has two 13 gal. and one 5 gal. side tank portions, a main and a reserve. This gives the machine an endurance of cruising speed of 300 hr. A hand starter is provided in the rear cockpit.

CHARACTERISTICS

Wing, upper and lower	39.6, 20.6
Span, upper and lower	4.6, 10.6
Tip	4.6, 10.6
Wing area	10.6, 10.6
Wing chord	10.6, 10.6
Wing thickness	10.6, 10.6
Wing dihedral	10.6, 10.6
Wing twist	10.6, 10.6
Wing loading	10.6, 10.6
Wing span	10.6, 10.6
Wing chord	10.6, 10.6
Wing thickness	10.6, 10.6
Wing dihedral	10.6, 10.6
Wing twist	10.6, 10.6
Wing loading	10.6, 10.6
Wing span	10.6, 10.6
Wing chord	10.6, 10.6
Wing thickness	10.6, 10.6
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Wing twist	10.6, 10.6
Wing loading	10.6, 10.6
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Wing loading	10.6, 10.6
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Wing dihedral	10.6, 10.6
Wing twist	10.6, 10.6
Wing loading	10.6, 10.6
Wing span	10.6, 10.6
Wing chord	10.6, 10.6
Wing thickness	10.6, 10.6
Wing dihedral	10.6, 10.6
Wing twist	10.6, 10.6
Wing loading	10.6, 10.6
Wing span	10.6, 10.6
Wing chord	10.6, 10.6
Wing thickness	10.6, 10.6
Wing dihedral	10.6, 10.6
Wing twist	10.6, 10.6
Wing loading	10.6, 10.6
Wing span	10.6, 10.6
Wing chord	10.6, 10.6
Wing thickness	10.6, 10.6
Wing dihedral	10.6, 10.6
Wing twist	10.6, 10.6
Wing loading	10.6, 10.6
Wing span	10.6, 10.6
Wing chord	10.6, 10.6
Wing thickness	10.6, 10.6
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Wing loading	10.6, 10.6
Wing span	10.6, 10.6
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Wing loading	10.6, 10.6
Wing span	10.6, 10.6
Wing chord	10.

AIRPORTS AND AIRWAYS

Cincinnati News

By Ralph Lee

May 11. E. Hoffman, commanding officer at the Grand Field, called on the Congress last week for a five-minute session at Dayton. During the course of Hoffman, Capt. Frank H. Probst, Dayton officer, will be removed.

Last, Wright-Venezuela, in charge of construction on the new Leckert Field, located in the river bottom, near Cincinnati, is making work on the new government field so that the opening will be made in the early fall. \$45,000 is being spent on the new field in construction work, hangars and modern utilities, respectively.

The first forced landing ever made in an Ohio river was made April 19 by Lewis Dwyler Miller (Dwyler) and Capt. John Pullman. While flying over the Ohio River, at an altitude of 500 ft., the engine went dead. Outrigger, piloting the ship, had to choose between landing in thick brush near the river, or the water. He chose the latter and suffered no mishap. A smaller boat from the shore where it was seen was dispatched and arrived at Grand Field.

Air mail service between Cincinnati and Cleveland probably will be maintained this summer. The Cincinnati-Cleveland airmail line, conferred with Postmaster Arthur L. Delaney last week and the latter expressed himself in favor of night service between the two cities. Watson is making efforts to save the cities between Cincinnati and Cleveland over beam lights in plain line, in the event his plan is accepted.

Seven new passenger ships, built especially for passenger service, are being completed by the Western Airport Co. for inter-city flights. Hugh Watson, president of the airport company, plans to expedite service between Cincinnati and Detroit when, to start immediately after the planes have been completed.

The Percy Flying Co. will conduct an instruction school this year, according to Wendell Percy, Cincinnati Field dealer, who is in charge of the field. Percy says that in addition to passenger planes flying he is going to have an instruction school as well as regular air advertising service.

Detroit, Mich.

By Nigel Smith

The "Madison Dearborn," the second Air-Pullman turned out by the Road Motor Airplane Co., is now making a daily round trip between Detroit and Chicago, carrying Ford freight and mail. This ship does not have the dual drive control, as the "Madison Dearborn" had, but is equipped with a single pilot's seat, with a single set of controls, placed immediately behind the engine.

Detroit citizens are finding that the constant use of aircraft in these business is productive of a very high factor of success. The Detroit Flyers, who have moved here from Fresno, Mich., are operating from the Seven Mile and Southfield fields. Available flying is being done using many different types of airplanes in this work.

Edith Stanton has received the former Marquette Plane Plant Co. Southfield, Mich., and plans to operate it under her name, Liberty 8 Standard, and JTB's for inter-city transport, short flights and student instruction.

A large class of students has been enrolled both by Greenough and the Western Plains. The former is operating from his Mason Road Field and adjacent field, the latter from the huge John R. and 16 Mile Fields.

What it is true that there has been a tremendous decrease in aerial activities, extending over a period of about two years, at Packard Field, this year should see a decided boost to all phases of commercial flying, at this advantageously situated airport.

It has been the writer's privilege to secure the Eastwood Field and all improvements and flying equipment from John Baker, owner of the property, and R. L. Franson, president,

Ontario (Ed) Co., who operated the field, members by last season. It is planned to put a number of new 3, 4 and 5 place ships on the field at an early date to accommodate the large weekend demand for flying.

The John R. and 16 Mile Road Field, comprising 100 acres, has been leased by the Hunsman-Taylor Airplane Co. for the season. It is planned to have an "Aviation Day" at this field soon, with open house to everybody, especially those coming by car, and with the kind assistance of the First Penn. Group, it is hoped to provide an occasion that will be a long and very profitable one for the 1935. Ford Air Station, San Diego, Hallow's Party has been.

Philadelphia, Pa.

The message which Capt. Victor Duffa, a Philadelphia aviator, carried on a flight from headquarters of Post Office's ship, was delivered on the afternoon of April 15 to Mayor Kendrick at the City Hall. The message was one of greetings and congratulations and written for the occasion of the Bicentennial celebration and was signed by Mayor James M. Carey of Boston. Captain Duffa, owner of the airplane of a flying field in this city, landed at the Pine Valley Field in New Jersey before Camden, and came to the city at night April 16. Mayor Kendrick received him at 1:30 p. m. April 16.

In a New England, Captain Duffa made the flight from the Boston municipal airport in 3 hr. 35 min. He received the message from Mayor Carey in front of the Boston municipal airport and handed by auto to the airport, arriving in Philadelphia at 3 p. m.

The message from Mayor Carey to Mayor Kendrick read: To The Mayor of Philadelphia, Pennsylvania. From The Mayor of Boston, Massachusetts.

Patriot Dec. 1935.

Greeting

On this, the 150th anniversary of the Battle of Gettysburg and the celebration of the battle, events that led to the establishment of American Independence and the expansion of the United States, on behalf of the City of Boston, solemnly associated with the days and deeds of that glorious epoch, I send you greetings and the sincere wish that the accomplished celebration of the 150th anniversary of the Declaration of Independence, in the year 1926, by the City of Philadelphia, where the national document was prepared and promulgated, may be marked by the success, ardor and honor to significance and importance demand.

The City of Boston holds on the hand of following to the City of Philadelphia, with the assurance that they all are one with the City of the Declaration on all that noble for the glory and honor of the Republic, the integrity and expansion of the National people, prosperity, maintenance and happiness of the American people.

James M. Carey

Memorandum, Ill.

The Air Mail field at Monmouth is now in full operation. The field is located on the shore of Lake Michigan, near Chicago, the superintendent. This was the Corbin Corp. Papers and it arrived late in the afternoon of April 28. It is reported that the Aerial Mercury and the Elan III will arrive at the field shortly. It is reported that the Elan III will arrive at the field shortly. It is reported that the Elan III will arrive at the field shortly. It is reported that the Elan III will arrive at the field shortly.

Prof. E. P. Warner of M.I.T. has visited the field several times and he is expected to be a frequent visitor during the summer. Frank Durand, Air Mail test pilot, had the Carter Pupac for an hour on April 28 to familiarize himself with the machine. In the afternoon he flew it to Grand Field, Chicago, for the first non-scouty test. Corp 7 Warts of the Corbin company is also at the field working on the tests.

Field Organization

By Ralph Lee

May 8. W. F. Schneider, vice president of the National Aeronautics Association, and former holder of the World Airplane Record, and R. E. Stoddard, vice president of the National Aeronautics Association, on May 15 will take up their duties with the new commercial Ford Air Station and the Grand West Airplane Co. at Detroit. Both W. F. Schneider will be superintendent of Flying Operations while Mr. Stoddard will be in charge of ground organization.

Major Schneider's experience as aviator has been extremely for his work at the Ford Air Station. He served in the U. S. Army in 1918 and served as mechanic and assistant pilot with some of the United States in the country until our entry in the war. During the war and for some time after, he was chief test pilot at McCook Field. While at McCook Field he made many altitude flights, among them the world and the two mile altitude records. He was the first to fly over the 1000 ft. Gordon Bennett race. He left the service in 1920 and became the aviation representative with the Underwriters Laboratories.

Mr. Stoddard was one of the pioneer aviators and ex-

New Haven, Conn.

A new concern has been incorporated under the name of the New Haven Air Terminal. The property located in that of Mr. W. Allen and outside from Woodward avenue to the former front.

The purpose of the company is to develop the property into a modern aviation field and airplane base to meet the demands of the commercial air service that have started to grow in the country.

This spot is an ideal one for the commercial machine, as it is within fifteen minutes of the heart of the city. It affords an unobstructed approach in every direction for both land and water machines and also a plenty of room for the expansion when the need arises.

The spot seemed to be ideal one for the New Haven. It affords space for both airplanes and land planes. The company is composed of local men who have a good knowledge of aviation. They will develop things at a moderate pace and with the idea of giving the New Haven people the best aviation service possible.

The airplane base will be developed first after which work will start on the field. On March 25 the workmen started working on the shore front a modern airplane hangar from which the water a large water tower will be built. Driveway and air tanks have already been installed. Outside have been placed for car large passenger flying boat, and several express boats, one school and one photographic machine. These will be put into service for passenger and other work to all points.

If there is enough demand passenger airplanes will run between New Haven and other cities. An aviation school will be conducted with a French instructor. An aerial mapping and photographing service will be available to anyone needing this type of work.

Panama, Minn.

By D. C. Case

There is a very good landing field at Panama. Although this one is haphazard or noncommercial, the field is only a few minutes' ride from the city center. The fuel, Gasolene or Standard gas can be obtained at the field by telephone. The field is owned by the county and can be used by anyone who wishes to do so.

Many times when Panama, Minn., was the field question and several private pilots have found it a very convenient stopping place.

Detroit Statistics

The Detroit (Detroit-Henrichs Luftverkehr) has been operating the line Kalamazoo-Kalamazoo-Grand Rapids-Muskegon for the last three years. The following table gives the main data on the airport.

	1934	1935	1936
Passenger	1,000	1,000	1,000
Freight	1,000	1,000	1,000
Trucks	1,000	1,000	1,000

Many of the passengers on this airport fly regularly and they are nicknamed "Lufthansa" (Airbus). These are reported to have made from thirty to sixty trips. The principal business of this line is carrying the common and mail of the Detroit area. The service is excellent. However, the average load per trip in 1935 was 1.91 passengers, 10.4 lb. of mail and 250 lb. of freight and average trip, 728 mi., roughly the distance from New York to Chicago.

Kalamazoo, Pa.

Prof. Jack H. Tread of New Haven has purchased two new MF Scout from the Kalamazoo School of Aviation. Henry Schneider of New York also bought a new boat for his use at Mr. Tread's. The Cleveland Airplane Co. bought two of the 1935 airplanes for their island. Arthur Baker, Kalamazoo, has bought a 1935 to use in connection with his other planes for aerial mapping.

Several students are due for training and the demand for planes has been greater this year than ever before.

Denish Air Services Consolidated

The Danish Government has arranged a merger of the two air transport companies of that country, the Danske Luftfartsselskab A. S., and a new company recently formed with the aid of German airplane manufacturing interests reports Commercial Aircraft H. Sorensen, Copenhagen. The new company is to be known as the Dansk Luftfartsselskab, with a capital of 500,000 crowns (\$100,000 in value of April 1). The company will receive a four-year license to operate a maximum of 250,000 crowns (\$50,000). As a result of the consolidation, it is expected that Danish proposals for contact with other Scandinavian and European air lines will be realized.



Ralph W. Schneider

B. Rood Shaw

UNITED STATES AIR FORCES

U. S. ARMY AIR SERVICE

Philippine Maneuvers

During the recent maneuvers of the Philippine Division, between First William Macdonald and Manila, Air Service played an important part. This is one of the first occasions where a whole group consisting of observation, pursuit, and bombardment participated in maneuvers carried out on so large a scale. Air Service Radio track was stationed near Davao, Headquarters of which point, Lt. Col. Hopper performed the duties of Air Service liaison Officer and relayed reports for service to the base at Camp Nichols. The radio work was most interesting and quite instructive. The entire scope of operations was photographed. Many photographs were made at positions held by friendly troops and rushed back to Headquarters. In short, the airplane proved itself very efficient in keeping the General in command accurately acquainted with the progress of his own units. Radio, Very pistols, smoke signals, message boys, and messengers all kinds were used as means of communication between planes and ground.

Bombing attacks were simulated upon bridges near the Pampanga River and other strategic points. The most spectacular of these attacks was that of an attack made by the Third Pursuit Squadron upon an anti-aircraft battery. At the time of the bombing attacks upon the bridges the ground command and in reply the situation of the recently discovered anti-aircraft battery. A "V" formation of B-24's, accompanied by high speed fighters, then dropped in column formation bombing down behind the smoke near the anti-aircraft gun. The B-24's gathered speed and with a final low dive headed straight for the gun. Bombs, coming in close to its targets, threw a shell into the muzzles. Again and again the battery was attacked until the bombers had done their work. The officers at Fort Mifflin seemed very pleased with the cooperation of the Air Service.

Bales Field

While on detailed service of the Kilnham Military Camp on the Island of Iloilo near the Iloilo-San Juan bridge, the 73rd Bombardment Squadron of Bales Field, Iloilo, after ten days of operations, turned to and closed a landing field on a bluff overlooking the great water, to be used in place of the old field which was destroyed during the campaign of May, 1924. The new field bears the name of "Bales Field," in all of recognition to John Bales, superintendent of the Bales National Park, at which the Kilnham station is a part, and through whose efforts the new airport was set aside from the public domain for military use.

Fifth Composite Group

During the month of March the 5th Composite Group, Air Service, stationed at Iloilo, has a total of 515 hours of available time, 45,480 man miles of scheduled cross country flights.

Army Air Orders

For Lt. Col. A. Y. Yacke, Jr., A.S., Bales Field, to Kelly Field.
By Lt. Col. A. Y. Yacke, Jr., A.S., Bales Field, to Kelly Field, to Kelly Field.

For Lt. Col. A. Y. Yacke, Jr., A.S., Bales Field, to Kelly Field, to Kelly Field.

For Lt. Col. A. Y. Yacke, Jr., A.S., Bales Field, to Kelly Field, to Kelly Field.



General Macdonald, First Sergeant Macdonald, and the new and old Air Service.

U. S. NAVAL AVIATION

New Endurance Record

The Navy Flying boat P-38 made a new endurance record of 28 hr. 30 min. May 3. She was piloted by Lt. J. B. Kite and C. H. Goldsberry of the U. S. Navy. The crewmen were L. M. Wootton of the Fordham company and Carl Mackintosh of the Chase company. When she took off she carried a total weight of 13,500 lb. composed of 1,300 gal. of gasoline, 110 gal. of oil, the crew of four and their supplies. The plane was over the Delaware River from the Philadelphia Navy Yard to Fort Belvoir, about 40 mi. The take off was made at 10:25 a. m. May 3 and about twenty-eight trips were made over the course, at 1:30 p. m. May 3, the longest duration circle about a mile a diameter at Philadelphia. The landing was made at 2:58 p. m. May 3. The record nearly doubles the previous record of 14 hr. 53 min. of last year. This flight demonstrates the capability of this type and the Fordham company to make the flight in 1955.

Porto Rico Flight

The Naval Airship Los Angeles arrived at Mayaguez, Porto Rico 6:15 p. m. May 4 and was moored to the mast on the Puerto Rico 7:30 p. m. She left San Juan at 10:45 a. m. May 3, then making the trip in 23 hr. from mast to mast.

Short Wave Radio

A detection of 2000 gals. was successfully worked with a short wave radio set in a Navy plane in flight during a search and hold at the Naval Air Station, Annapolis, D. C. Signals from the plane, a Navy D-44B type, were heard in 80 ft. Paul, Miami, and Tampa, Fla., but were not heard at stations south of Miami. The plane was in communication with the Naval Radio Research Laboratory at Bolling, D. C., on a 20 meter wave

length up to a distance of 60 mi., at which point signals from the plane were no longer heard, later reports being of the reception with good audibility of the signals in 80 ft. Paul and Tampa. The apparent to be a possibility of transmission using very short wave lengths. Experiments with this type of radio equipment by the Navy during the past year have shown that signals in wave lengths below forty miles have been received as a "pulsed" effect, that is, the signals were received in short bursts, changing for a distance varying from 300 to 700 mi., responding at distant point.

The light weight transmitter in the plane used only two more a. m. and the reception of signals from the set 2000 gals. is believed to be a record for heavier than any other radio equipment.

Being in the plane while in flight using the 20 meter wave length was possible only up to 40 mi., due to the receiver interference experienced from the airplane system of the plane. This is due to the fact that such of the 24 square miles of the Liberty engine with which the plane is powered about a demagnetizing station, sending out strong signals so that the wave length of the radio set (twenty meters) did not speak through these signals are very limited and difficult to tune out. Attempts are now being made to overcome this difficulty.

The development of high frequency, short wave radio equipment for use in aircraft in flight, is based largely on experiments that have been carried on for the past few months at the Naval Research Laboratory at Bolling, D. C., the Naval Flying Field at Quantico, Va., and the Naval Air Station, Elizabeth, N. J. Experimental short wave sets at these stations operated from the ground have been able to make a short wave set in New Zealand, being able to receive signals from a distance of 1000 miles. It is hoped that the adaptation of short wave radio equipment of extreme light weight will open up a new field for the use of radio in aircraft.

Los Angeles Flight

The U. S. Naval Airship Los Angeles made her annual flight in Bermuda April 21. It was hoped to take the airship from her longest about 4,000 a. m. but a strong wind was blowing which prevented the flight. She was put in the air on May 1 at 11:30 a. m. She was first spotted over Bermuda at 2:30 a. m. April 22. She then turned around again and was lost to view until about 5:30. After emerging she sailed for her base, being reported over the U. S. S. Point at 8:30 and was recovered within the hour. This morning was made in the time of a 40 mi. wind and is the first time that any American airship has been recovered under such difficult conditions.

During the journey, Capt. George W. Stiles, executive officer of the Los Angeles, said:

"We landed miles out of Hamilton Harbor, which we left about 9 a. m. April 23, on course to run into strong land

winds. This caused us to ascend to higher altitudes. We rose from 500 ft. to somewhere as high as 2,000 ft. Once Cape Hamilton we narrowly avoided waves and transfer stations, and the intensity of the winds flying on as we passed northward. This caused the delay in getting back."

"The ship responded to control with remarkable smoothness. Part of the way in the return trip we played cards with water and were possible as a result of this. I slept four hours during the night and if the going was rough an sea on board control it particularly."

All through the night as the heavy winds, the Los Angeles was guided over the Atlantic by radio compass beams from various stations. The radio operated perfectly so that at no time was the ship off its course, it was said, despite poor visibility and wind resistance.

It was just 4:25 a. m. April 23, as the sky in the East was lighting up with the first streaks of dawn, that the watchers at the base held out the ship appearing. Light on the morning mist at the naval station had been burning since 11:00 a. m. as a beacon to aid the ship. The Los Angeles had been expected to reach her base at about 2 a. m.

Flying at an altitude of 1,000 ft. the ship maneuvered over the landing field, making progress with difficulty in the face of a strong wind. The land breeze blew at 16 mi. per hour, leading the ground crew at first to believe that the ship would have to go to the next extent of into the harbor. The ground crew, however, on the chance that a full night night and give an opportunity to get the Los Angeles into the harbor.

This opportunity was just what Cmdr. J. H. Kite, Jr., pilot of the Los Angeles, had in mind. During the night the ship was in the wind the signal was given and the ship was brought down and was taken in hand by the ground crew without difficulty. Without making the landing had been safely landed the crew, still looking fresh, was dismissed.

The Los Angeles left Elizabeth for Bermuda with forty persons aboard and returned with forty-two. Two officers from the Pacific, transferred to service in Philadelphia, were added to the passenger list. Two tons of mail were taken to the British islands by the ship and she returned with three. The return mail arrived 30 hr. sooner than it would have come by steamship.

Navy Air Orders

For Lt. Col. A. Y. Yacke, Jr., A.S., Bales Field, to Kelly Field, to Kelly Field.

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For Lt. Col. A. Y. Yacke, Jr., A.S., Bales Field, to Kelly Field, to Kelly Field.

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USS Los Angeles

The USS Los Angeles (ZR-2) is the latest of a series of rigid inflatable boats developed by the Navy. She is a rigid inflatable boat with a hull and many of the parts are made of aluminum alloy.

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DESIGNING and construction
of all metal twin motored
airplanes guaranteed to fly with
normal load on one motor.

Illustration showing aircraft equipped with
engine machinery also shown in the upper right
corner stopped, indicated on April 15, 1938

I Type S-29—Power plant, 2 Liberty
400, HP. Speed, 110 miles an hour.
Normal pay load, 3,000 lbs. for 600 mile
cruise. Equipment, 16 seats (including
pilot and mechanic) or sleeping accommo-
dations for 8, buffet, lavatory, etc.

II Type S-30—Power plant, two 200
HP motors. Speed 100 miles an hour.
Normal pay load, 1,500 lbs. for 500 mile
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(including pilot), buffet, lavatory, etc.

III Also single motored airplanes and
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Plant there stands a small flyer which
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The moment it comes in from a flight it
is inspected, tuned-up, refueled, and put
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Its cargoes are unique—a big manufac-
turer suddenly finds himself short on a
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needs parts for a broken air compressor—
can we bring a supply at once from a city
500 miles away?—we can, and do.

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photograph in a tearing hurry—out goes
the little plane, with a single slip of card-
board for freight.

For more than a year this little Martin
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record for service. Speedy—Reliable—
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Many governmental as well as commercial aeronautical engineers throughout the world have followed intently each step in the development of air-cooled motors, and they now realize that all the many advantages of an air-cooled aeronautical power plant may be obtained in the Wright J-4, 200 H. P.

Bulletin No. 8 fully describing the Wright J-4 engine, together with specifications etc. will be mailed upon request.

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*Saves weight in power plant and plane.
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*Increased flying time.
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